

# BEST AVAILABLE COPY

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-135096

(43)Date of publication of application : 22.05.1998

(51)Int.Cl.

H01L 21/02  
G06F 17/60

(21)Application number : 08-303506

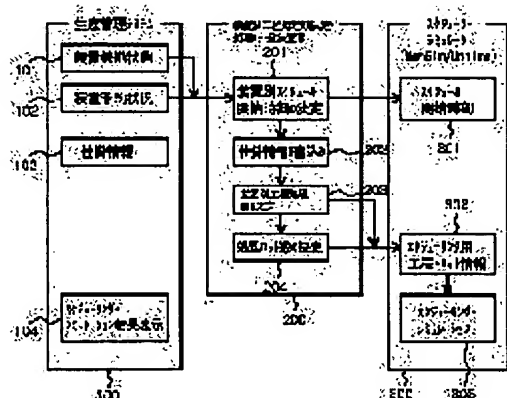
(71)Applicant : NITTETSU SEMICONDUCTOR KK

(22)Date of filing : 30.10.1996

(72)Inventor : FUKUSHIMA SHINICHI  
TORIKAI KENICHI**(54) SCHEDULING METHOD IN SEMICONDUCTOR MANUFACTURE****(57)Abstract:**

**PROBLEM TO BE SOLVED:** To provide a scheduling method in semiconductor manufacture, which can reduce the variation of quantity of works in process at respective processing steps and can stabilize the work-in-process balance of an overall manufacture factory.

**SOLUTION:** The scheduling method is to execute scheduling simulation by a scheduler simulator 300, based on various information given from a production control system 100. A processing for using a processing step order determination/number-of-processing lots determination part by individual apparatus 200 is executed between the production control system 100 and the scheduler simulator 300. The processing is to write (202) start time and work-in-process information 103 from the production control system 100, to decide (203) the order of the processing steps after schedule start time, based on the write content and to determine (204) how many lots are to be processed in each processing step.

**LEGAL STATUS**

[Date of request for examination] 06.10.2003

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the  
examiner's decision of rejection or application  
converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

CLAIMS

---

[Claim(s)]

[Claim 1] In the scheduling approach in the semi-conductor manufacture which performs scheduling simulation by the scheduler simulator based on the equipment operating status information, equipment reservation status information, and mechanism information which are given from a production control system Based on said equipment operating status information and equipment reservation status information, the schedule start time classified by equipment is determined. Based on this decision value, write in said mechanism information, and the sequence of down stream processing after the schedule start time in each manufacturing installation for all the manufacturing installations in a semi-conductor plant is determined based on these write-in contents. The scheduling approach in the semi-conductor manufacture characterized by determining what lot processing of the lot of each down stream processing by this decision is carried out, and supplying said scheduler simulator with this result.

[Claim 2] The equipment for a schedule of the decision of said down-stream-processing sequence is the process which can be processed. Down stream processing in front of schedule start time exceeds the process which can be processed. That to which front-face down stream processing of equipment of the process concerned exceeded each number of the down-stream-processing minimum lots is made into down stream processing for a schedule. The scheduling approach in the semi-conductor manufacture according to claim 1 characterized by computing  $\geq$  (the number of the front-face mechanisms of down stream processing) (the number of the front-face mechanisms of degree process) to all applicable processes, and setting process processing as descending of this calculation value.

[Claim 3] The decision of said number of processing lots is the scheduling approach in the semi-conductor manufacture according to claim 1 which makes the down stream processing the number of the maximum mechanism lots when the front-face mechanism of down stream processing exceeds the number of the minimum mechanism lots, and is characterized by making the front mechanism of the down stream processing into the number of processing lots on the other hand when the front-face mechanism of down stream processing is less than the number of the maximum mechanism lots.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

DETAILED DESCRIPTION

---

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the scheduling approach in the semi-conductor manufacture for attaining equalization of in-process inventory especially about the scheduling approach in semi-conductor manufacture.

[0002]

[Description of the Prior Art] Generally the scheduling approach in a manufacturing department is built using \*\* production control system and \*\* scheduler simulator. The above-mentioned production control system is constituted here based on (a) equipment operating status information bureau, (b) equipment reservation status information section, (c) mechanism information bureau, and (d) scheduler simulation result display.

[0003] An equipment operating-status information bureau shows the operating status of all the manufacturing installations in a semi-conductor plant, while the equipment concerned works, it is the information which shows whether it is in which condition in failure, a maintenance, and un-working (waiting for a lot), and the equipment reservation status-information section is information which shows a settled lot processing schedule and a settled maintenance schedule including under the operation after the present time of day of all the manufacturing installations in a semi-conductor plant.

[0004] Moreover, a mechanism information bureau is information which shows a process progress situation including under processing by the equipment according to form in the present time of day of all the lots that exist in a semi-conductor plant. Furthermore, a scheduler simulation result display is the information for performing the display of a result called for by the scheduler simulator.

[0005] The scheduler simulator has composition containing (i) schedule initiation time information, (ii) scheduling, and the order of the lot processing classified by manufacturing installation and the number information of processing lots for simulation, and the scheduling (iii) simulation activation section. Here, schedule initiation time information shows the completion schedule time of day of all the conditions under operation of all the manufacturing installations in a semi-conductor plant, a maintenance, and failure or a processing schedule lot, and the completion schedule time of day of a maintenance schedule, and the time of day or later is set as the creation object of a scheduler simulator. moreover, scheduling -- the order of the lot processing classified by manufacturing installation and the number of processing lots for - simulation process in the order which began equipment, when there are many front mechanisms, continues the lot of the same form and is processed. Furthermore, the scheduling simulation activation section is the basic function of commercial software, and performs scheduling simulation according to the order shown in the information on the above (ii).

[0006]

[Problem(s) to be Solved by the Invention] however, scheduling [ in / at the above-mentioned conventional example / a scheduler simulator ] -- in the order of processing of the order of the lot processing classified by manufacturing installation and the number of processing lots for - simulation, since the number of processing lots had not been determined to each down stream processing, without evaluating the front-face mechanism lot of equipment before and behind down stream processing for a schedule ( mechanism balance), the mechanism balance of dispersion and the whole semi-conductor plant had unstable in-process inventory for every down stream processing.

[0007] In view of the above-mentioned trouble, this invention reduces dispersion in the in-process inventory for every down stream processing, and aims at offering the scheduling approach in the semi-conductor manufacture which can carry out mechanism balance of the whole plant to stability.

[0008]

[Means for Solving the Problem] Like a publication the approach of realizing the purpose of invention concerning this

application, to claim 1 In the scheduling approach in the semi-conductor manufacture which performs scheduling simulation by the scheduler simulator based on the equipment operating status information, equipment reservation status information, and mechanism information which are given from a production control system Based on said equipment operating status information and equipment reservation status information, the schedule start time classified by equipment is determined. Based on this decision value, write in said mechanism information, and the sequence of down stream processing after the schedule start time in each manufacturing installation for all the manufacturing installations in a semi-conductor plant is determined based on these write-in contents. It determines what lot processing of the lot of each down stream processing by this decision is carried out, and is in the approach of supplying said scheduler simulator with this result.

[0009] According to this approach, based on the information from a scheduler simulator, the front-face mechanism lot of equipment before and behind down stream processing for a schedule (mechanism balance) is evaluated, the order of the process processing classified by equipment is determined based on this, and the number of processing lots is further determined to each down stream processing. Therefore, dispersion in the in-process inventory for every down stream processing is reduced, and the mechanism balance of the whole semi-conductor plant is stabilized.

[0010] The concrete method of realizing the purpose of invention concerning this application To claim 2, like a publication the decision of said down-stream-processing sequence The equipment for a schedule is the process which can be processed and down stream processing in front of schedule start time exceeds the process which can be processed. And front-face down stream processing of equipment of the process concerned makes the thing beyond each number of the down-stream-processing minimum lots down stream processing for a schedule, computes  $\geq$  (the number of the front-face mechanisms of down stream processing) (the number of the front-face mechanisms of degree process) to all applicable processes, and is in the approach of setting process processing as descending of this calculation value.

[0011] According to this approach, down stream processing for a schedule is distinguished by the comparison with down stream processing in front of schedule start time, and the process concerned which can be processed, and the comparison with the front-face down stream processing of process equipment concerned, and each number of the down-stream-processing minimum lots, and the order of processing is distinguished by the comparison of the number of the front-face mechanisms of down stream processing concerned, and the number of the front-face mechanisms of degree process. Therefore, down-stream-processing sequence can be determined by the easy approach.

[0012] Like, the concrete method of realizing the purpose of invention concerning this application makes the down stream processing the number of the maximum mechanism lots, when [ according to claim 3 ] the front-face mechanism of down stream processing exceeds the number of the minimum mechanism lots, and on the other hand, the decision of said number of processing lots has it in the approach of making the front mechanism of the down stream processing the number of processing lots, when the front-face mechanism of down stream processing is less than the number of the maximum mechanism lots.

[0013] According to this approach, the number of processing lots is calculated based on the comparison of the front-face mechanism of down stream processing concerned, and the number of the minimum mechanism lots. Therefore, down-stream-processing sequence can be determined by the easy approach.

[0014]

[Embodiment of the Invention] Drawing 1 is the block diagram showing the process of the scheduling approach in semi-conductor manufacture of this invention.

[0015] The scheduling approach by this invention consists of three parts, a production control system 100, the number decision section 200 of order decision [ of the process processing classified by equipment ] / processing lots, and the scheduler simulator 300.

[0016] A production control system 100 consists of the equipment operating status information bureau 101, the equipment reservation status information section 102, the mechanism information bureau 103, and the scheduling simulation result display 104. The equipment operating status information bureau 101 is the information about the operating status of all the manufacturing installations in a semi-conductor plant, and while the equipment concerned works, it shows whether it is in which condition in failure, a maintenance, and un-working (waiting for a lot). The equipment reservation status information section 102 is information which shows a settled lot processing schedule and settled maintenance schedule including under the operation after the present time of day of all the manufacturing installations in a semi-conductor plant. Moreover, the mechanism information bureau 103 is information which shows a process progress situation including under processing by the equipment according to form in the present time of day of all the lots that exist in a semi-conductor plant. Furthermore, the scheduler simulation result display 104 is the information for performing the display of a result called for by the scheduler simulator.

[0017] Furthermore, the number decision section 200 of order decision [ of the process processing classified by

equipment ] / processing lots is just going to consider as the description of this invention, and consists of the schedule start time decision section 201 classified by equipment, the mechanism information write-in section 202, the order decision section 203 of the process processing classified by equipment, and the number decision section 204 of processing lots. The schedule start time decision section 201 classified by equipment sets the schedule after the time of day as the object of creation about the completion schedule time of day of all the conditions under operation of all the manufacturing installations in a semi-conductor plant, failure, and maintenance or a processing schedule lot, and the completion schedule time of day of a maintenance schedule. The mechanism information write-in section 202 is used in order to process and use the mechanism information bureau 103 henceforth [ order decision section of the process processing classified by equipment 203 ] and to write in on a database.

[0018] Moreover, the order decision section 203 of the process processing classified by equipment makes the sequence decision of down stream processing after the schedule start time in each manufacturing installation for all the manufacturing installations in a semi-conductor plant. Specifically, the process in the equipment concerned which can be processed is extracted to the equipment for a schedule. Subsequently, the extracted process confirms whether it is in agreement with down stream processing in front of schedule start time, and is aimed only at the process of an inequality for it. Furthermore, the front-face mechanism loan of equipment of the process concerned confirms whether to be more than the number of Min lots of each down stream processing to all the processes that can be processed of fulfilling the above-mentioned conditions. And all the above-mentioned conditions are fulfilled to down stream processing for a schedule. Here, the mechanism balance of the whole semi-conductor plant is further taken into consideration to down stream processing for a schedule. The front-face mechanism of equipment of degree process of the number of the front-face mechanism lots of equipment of down stream processing for a schedule and the process concerned is evaluated. the front mechanism of the down stream processing concerned -- many -- a process with few front mechanisms of degree process -- namely, -- "-- the number of front-face mechanisms of down stream processing - concerned -- process processing shall be performed sequentially from the large thing of number of front-face mechanisms of degree process"

[0019] Furthermore, it is shown that the number decision section 204 of processing lots determines what lot processing of the lot of the process concerned is carried out to each down stream processing determined in the order decision section 203 of the process processing classified by equipment. Specifically, the front mechanism of the down stream processing concerned makes a Max value the number of processing lots about down stream processing more than the number of Max mechanism lots. The front mechanism of the down stream processing concerned makes the front mechanism of the down stream processing concerned in the time concerned the number of processing lots about the thing of under the number of Max mechanism lots.

[0020] Next, the scheduler simulator 300 consists of the schedule start time decision section 301, scheduling, and the order of the lot processing classified by manufacturing installation and the number information bureau of processing lots 302 for simulation, and the scheduling simulation activation section 303.

[0021] Here, the schedule initiation time information 301 shows the completion schedule time of day of all the conditions under operation of all the manufacturing installations in a semi-conductor plant, a maintenance, and failure or a processing schedule lot, and the completion schedule time of day of a maintenance schedule, and the time of day or later is set as the creation object of a scheduler simulator. Moreover, the order of the lot processing classified by manufacturing installation and the number information bureau 302 of processing lots for scheduling and simulation hold the information about the order of down stream processing and its number of lots according to manufacturing installation for the scheduling simulation obtained in the order decision section 203 of the process processing classified by equipment, and the number decision section 204 of processing lots. Furthermore, the scheduling simulation activation section 303 is the basic function of commercial software, and is a part which processes in the order which began equipment, and continues and processes the number of lots of the same form process when there are many front mechanism loans.

[0022] Drawing 2 shows the detail of processing of the order decision section 203 of the process processing classified by equipment in drawing 1 , and drawing 3 shows the detail of processing of the number decision section 204 of processing lots. In addition, "S" means the step below.

[0023] In drawing 2 , if processing of the order decision section 203 of the process processing classified by equipment is started (S203a), first, the equipment for a schedule will be extracted (S203b), it will confirm whether to be the process of the equipment which can be processed (S203c), and the process in the equipment which can be processed will be extracted (S203d). Next, it confirms whether it is in agreement with down stream processing in front of schedule start time (S203e), and it is aimed only at the process of an inequality.

[0024] Subsequently, it confirms whether the front-face mechanism of process equipment concerned exceeds each number of down-stream-processing Min (min) lots to all the processes that can be processed of fulfilling the above-

mentioned conditions (S203f), and all the above-mentioned conditions are fulfilled to down stream processing for a schedule (S203g). In addition, about what does not fulfill conditions on the way, rerun is performed from the extract of down stream processing. Here, the mechanism balance of the whole semi-conductor plant is further taken into consideration to down stream processing for a schedule. The front-face mechanism of equipment of the number of the front-face mechanism lots of equipment of down stream processing for a schedule and the process concerned is evaluated. the front mechanism of the down stream processing concerned -- many -- a process with few front mechanisms of degree process -- that is, -- "-- the number of front-face mechanisms of down stream processing - concerned -- number of front-face mechanisms of degree process" is judged (S203h), and process processing is performed to descending of this value (S203i). It performs until the scheduling of all manufacturing installations completes this procedure (S203j). If the scheduling of all manufacturing installations is completed, processing of the order decision section 203 of the process processing classified by equipment will be ended (S203k).

[0025] Next, with reference to drawing 3 , processing of the number decision section 204 of processing lots is explained.

[0026] Initiation of processing performs the comparison (the number of front-face mechanism of down stream processing  $\geq$  Max mechanism lots concerned) with the front-face mechanism of down stream processing concerned, and the number of Max (max) mechanism lots (S204b). (S204a) When "the number of front-face mechanism of down stream processing  $>$  Max mechanism lots concerned" is judged, the down stream processing is made into the number of Max mechanism lots (S204c), and processing is ended (S204d). On the other hand, when "the number of front-face mechanism of down stream processing  $<$  Max mechanism lots concerned" is judged by S204b, the front mechanism of the down stream processing concerned is made into the number of processing lots (S204e), and processing is ended (S204f).

[0027] Table 1 and 2 shows the in-process inventory according to equipment process in specific time of day. These show the result of having written in the mechanism information bureau 103 in the order decision section 203 of the process processing classified by equipment, and are edited into the format of Table 1 in the case of the decision of the sequence in the order decision section 203 of the process processing classified by equipment. And the front-face mechanism lot of equipment before and behind down stream processing for a schedule (mechanism balance) is evaluated, and it utilizes for the decision of the order of the process processing classified by equipment. Specifically, the processes which can be processed by the manufacturing installation A are 4 of Process a, Process d, Process i, and Process m processes. For 15 lots and Process d, four lots and Process i are [ Process a / 18 lots and Processes m of the number of mechanism lots of these four processes ] nine lots. Moreover, for three lots and Process d, six lots and Process i are [ Process a / 12 lots and Processes m of the number of mechanism lots of degree process ] five lots. Here, if it assumes that the front mechanism of four process is over a Min value above and the value of X is computed, 6 and Process m will be set [ 12 and Process d ] to 4 by 2 and Process i, and Process a will be processed in order of the process a-> process i-> process m-> process d. In addition, a manufacturing installation B is processed similarly and comes to be shown in Table 2.

[0028]

[Table 1]

製造装置 A

工程	同工程仕掛	次工程仕掛
a	15	3
d	4	6
i	18	12
m	9	5

[0029]

[Table 2]

製造装置 B

工程	同工程仕掛	次工程仕掛
b	12	4
e	8	6
z	10	8

Table 3 shows the Min value-Max value classified by process. A Min-Max value is a value given beforehand, and when the number of the front-face mechanisms of a process is below Min, the process concerned does not turn into down stream processing for a schedule. Moreover, when the number of the front-face mechanisms of a process is more than Max, the value (Max value) is made into the number of processing lots of the process concerned.

[0030]

[Table 3]

工程	Min 値	Max 値
a	3	15
b	3	15
c	3	15
d	3	15
e	2	15
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
x	5	15
y	5	15
z	5	15

[0031]

[Effect of the Invention] As explained above, this invention shown in claim 1 Based on the equipment operating status information and equipment reservation status information which are given from a production control system, the schedule start time classified by equipment is determined. Based on this decision value, write in said mechanism information, and the sequence of down stream processing after the schedule start time in each manufacturing installation for all the manufacturing installations in a semi-conductor plant is determined based on these write-in contents. Since it determines what lot processing of the lot of each down stream processing by this decision is carried out and said scheduler simulator was supplied with this result, dispersion in the in-process inventory for every down stream processing is reduced, and the mechanism balance of the whole semi-conductor plant is stabilized.

[0032] The equipment for a schedule of this invention shown in claim 2 is the process which can be processed. Down stream processing in front of schedule start time exceeds the process which can be processed. That to which front-face down stream processing of equipment exceeded each number of the down-stream-processing minimum lots is made into down stream processing for a schedule.  $\geq$  (the number of the front-face mechanisms of down stream processing) (the number of the front-face mechanisms of degree process) is computed to all applicable processes, and since said down-stream-processing sequence was determined by performing process processing to descending of this calculation value, down-stream-processing sequence can be determined by the easy approach.

[0033] Since this invention shown in claim 3 determined said number of processing lots by making the down stream processing into the number of the maximum mechanism lots when the front-face mechanism of down stream processing exceeds the number of the minimum mechanism lots, and on the other hand making the front mechanism of down stream processing into the number of processing lots when the front-face mechanism of down stream processing is less than the number of the maximum mechanism lots, it can determine down-stream-processing sequence by the easy approach.

[Translation done.]



\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

TECHNICAL FIELD

---

[Field of the Invention] This invention relates to the scheduling approach in the semi-conductor manufacture for attaining equalization of in-process inventory especially about the scheduling approach in semi-conductor manufacture.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

PRIOR ART

---

[Description of the Prior Art] Generally the scheduling approach in a manufacturing department is built using \*\* production control system and \*\* scheduler simulator. The above-mentioned production control system is constituted here based on (a) equipment operating status information bureau, (b) equipment reservation status information section, (c) mechanism information bureau, and (d) scheduler simulation result display.

[0003] An equipment operating-status information bureau shows the operating status of all the manufacturing installations in a semi-conductor plant, while the equipment concerned works, it is the information which shows whether it is in which condition in failure, a maintenance, and un-working (waiting for a lot), and the equipment reservation status-information section is information which shows a settled lot processing schedule and a settled maintenance schedule including under the operation after the present time of day of all the manufacturing installations in a semi-conductor plant.

[0004] Moreover, a mechanism information bureau is information which shows a process progress situation including under processing by the equipment according to form in the present time of day of all the lots that exist in a semi-conductor plant. Furthermore, a scheduler simulation result display is the information for performing the display of a result called for by the scheduler simulator.

[0005] The scheduler simulator has composition containing (i) schedule initiation time information, (ii) scheduling, and the order of the lot processing classified by manufacturing installation and the number information of processing lots for simulation, and the scheduling (iii) simulation activation section. Here, schedule initiation time information shows the completion schedule time of day of all the conditions under operation of all the manufacturing installations in a semi-conductor plant, a maintenance, and failure or a processing schedule lot, and the completion schedule time of day of a maintenance schedule, and the time of day or later is set as the creation object of a scheduler simulator. moreover, scheduling -- the order of the lot processing classified by manufacturing installation and the number of processing lots for - simulation process in the order which began equipment, when there are many front mechanisms, continues the lot of the same form and is processed. Furthermore, the scheduling simulation activation section is the basic function of commercial software, and performs scheduling simulation according to the order shown in the information on the above (ii).

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

EFFECT OF THE INVENTION

---

[Effect of the Invention] As explained above, this invention shown in claim 1 Based on the equipment operating status information and equipment reservation status information which are given from a production control system, the schedule start time classified by equipment is determined. Based on this decision value, write in said mechanism information, and the sequence of down stream processing after the schedule start time in each manufacturing installation for all the manufacturing installations in a semi-conductor plant is determined based on these write-in contents. Since it determines what lot processing of the lot of each down stream processing by this decision is carried out and said scheduler simulator was supplied with this result, dispersion in the in-process inventory for every down stream processing is reduced, and the mechanism balance of the whole semi-conductor plant is stabilized.

[0032] The equipment for a schedule of this invention shown in claim 2 is the process which can be processed. Down stream processing in front of schedule start time exceeds the process which can be processed. That to which front-face down stream processing of equipment exceeded each number of the down-stream-processing minimum lots is made into down stream processing for a schedule.  $\geq$  (the number of the front-face mechanisms of down stream processing) (the number of the front-face mechanisms of degree process) is computed to all applicable processes, and since said down-stream-processing sequence was determined by performing process processing to descending of this calculation value, down-stream-processing sequence can be determined by the easy approach.

[0033] Since this invention shown in claim 3 determined said number of processing lots by making the down stream processing into the number of the maximum mechanism lots when the front-face mechanism of down stream processing exceeds the number of the minimum mechanism lots, and on the other hand making the front mechanism of down stream processing into the number of processing lots when the front-face mechanism of down stream processing is less than the number of the maximum mechanism lots, it can determine down-stream-processing sequence by the easy approach.

---

[Translation done.]

\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

TECHNICAL PROBLEM

---

[Problem(s) to be Solved by the Invention] however, scheduling [ in / at the above-mentioned conventional example / a scheduler simulator ] -- in the order of processing of the order of the lot processing classified by manufacturing installation and the number of processing lots for - simulation, since the number of processing lots had not been determined to each down stream processing, without evaluating the front-face mechanism lot of equipment before and behind down stream processing for a schedule ( mechanism balance), the mechanism balance of dispersion and the whole semi-conductor plant had unstable in-process inventory for every down stream processing.

[0007] In view of the above-mentioned trouble, this invention reduces dispersion in the in-process inventory for every down stream processing, and aims at offering the scheduling approach in the semi-conductor manufacture which can carry out mechanism balance of the whole plant to stability.

---

[Translation done.]

## \* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

MEANS

---

[Means for Solving the Problem] Like a publication the approach of realizing the purpose of invention concerning this application, to claim 1 In the scheduling approach in the semi-conductor manufacture which performs scheduling simulation by the scheduler simulator based on the equipment operating status information, equipment reservation status information, and mechanism information which are given from a production control system Based on said equipment operating status information and equipment reservation status information, the schedule start time classified by equipment is determined. Based on this decision value, write in said mechanism information, and the sequence of down stream processing after the schedule start time in each manufacturing installation for all the manufacturing installations in a semi-conductor plant is determined based on these write-in contents. It determines what lot processing of the lot of each down stream processing by this decision is carried out, and is in the approach of supplying said scheduler simulator with this result.

[0009] According to this approach, based on the information from a scheduler simulator, the front-face mechanism lot of equipment before and behind down stream processing for a schedule (mechanism balance) is evaluated, the order of the process processing classified by equipment is determined based on this, and the number of processing lots is further determined to each down stream processing. Therefore, dispersion in the in-process inventory for every down stream processing is reduced, and the mechanism balance of the whole semi-conductor plant is stabilized.

[0010] The concrete method of realizing the purpose of invention concerning this application To claim 2, like a publication the decision of said down-stream-processing sequence The equipment for a schedule is the process which can be processed and down stream processing in front of schedule start time exceeds the process which can be processed. And front-face down stream processing of equipment of the process concerned makes the thing beyond each number of the down-stream-processing minimum lots down stream processing for a schedule, computes  $\geq$  (the number of the front-face mechanisms of down stream processing) (the number of the front-face mechanisms of degree process) to all applicable processes, and is in the approach of setting process processing as descending of this calculation value.

[0011] According to this approach, down stream processing for a schedule is distinguished by the comparison with down stream processing in front of schedule start time, and the process concerned which can be processed, and the comparison with the front-face down stream processing of process equipment concerned, and each number of the down-stream-processing minimum lots, and the order of processing is distinguished by the comparison of the number of the front-face mechanisms of down stream processing concerned, and the number of the front-face mechanisms of degree process. Therefore, down-stream-processing sequence can be determined by the easy approach.

[0012] Like, the concrete method of realizing the purpose of invention concerning this application makes the down stream processing the number of the maximum mechanism lots, when [ according to claim 3 ] the front-face mechanism of down stream processing exceeds the number of the minimum mechanism lots, and on the other hand, the decision of said number of processing lots has it in the approach of making the front mechanism of the down stream processing the number of processing lots, when the front-face mechanism of down stream processing is less than the number of the maximum mechanism lots.

[0013] According to this approach, the number of processing lots is calculated based on the comparison of the front-face mechanism of down stream processing concerned, and the number of the minimum mechanism lots. Therefore, down-stream-processing sequence can be determined by the easy approach.

[0014]

[Embodiment of the Invention] Drawing 1 is the block diagram showing the process of the scheduling approach in semi-conductor manufacture of this invention.

[0015] The scheduling approach by this invention consists of three parts, a production control system 100, the number decision section 200 of order decision [ of the process processing classified by equipment ] / processing lots, and the

scheduler simulator 300.

[0016] A production control system 100 consists of the equipment operating status information bureau 101, the equipment reservation status information section 102, the mechanism information bureau 103, and the scheduling simulation result display 104. The equipment operating status information bureau 101 is the information about the operating status of all the manufacturing installations in a semi-conductor plant, and while the equipment concerned works, it shows whether it is in which condition in failure, a maintenance, and un-working (waiting for a lot). The equipment reservation status information section 102 is information which shows a settled lot processing schedule and settled maintenance schedule including under the operation after the present time of day of all the manufacturing installations in a semi-conductor plant. Moreover, the mechanism information bureau 103 is information which shows a process progress situation including under processing by the equipment according to form in the present time of day of all the lots that exist in a semi-conductor plant. Furthermore, the scheduler simulation result display 104 is the information for performing the display of a result called for by the scheduler simulator.

[0017] Furthermore, the number decision section 200 of order decision [ of the process processing classified by equipment ] / processing lots is just going to consider as the description of this invention, and consists of the schedule start time decision section 201 classified by equipment, the mechanism information write-in section 202, the order decision section 203 of the process processing classified by equipment, and the number decision section 204 of processing lots. The schedule start time decision section 201 classified by equipment sets the schedule after the time of day as the object of creation about the completion schedule time of day of all the conditions under operation of all the manufacturing installations in a semi-conductor plant, failure, and maintenance or a processing schedule lot, and the completion schedule time of day of a maintenance schedule. The mechanism information write-in section 202 is used in order to process and use the mechanism information bureau 103 henceforth [ order decision section of the process processing classified by equipment 203 ] and to write in on a database.

[0018] Moreover, the order decision section 203 of the process processing classified by equipment makes the sequence decision of down stream processing after the schedule start time in each manufacturing installation for all the manufacturing installations in a semi-conductor plant. Specifically, the process in the equipment concerned which can be processed is extracted to the equipment for a schedule. Subsequently, the extracted process confirms whether it is in agreement with down stream processing in front of schedule start time, and is aimed only at the process of an inequality for it. Furthermore, the front-face mechanism loan of equipment of the process concerned confirms whether to be more than the number of Min lots of each down stream processing to all the processes that can be processed of fulfilling the above-mentioned conditions. And all the above-mentioned conditions are fulfilled to down stream processing for a schedule. Here, the mechanism balance of the whole semi-conductor plant is further taken into consideration to down stream processing for a schedule. The front-face mechanism of equipment of degree process of the number of the front-face mechanism lots of equipment of down stream processing for a schedule and the process concerned is evaluated. the front mechanism of the down stream processing concerned -- many -- a process with few front mechanisms of degree process -- namely, -- "-- the number of front-face mechanisms of down stream processing - concerned -- process processing shall be performed sequentially from the large thing of number of front-face mechanisms of degree process"

[0019] Furthermore, it is shown that the number decision section 204 of processing lots determines what lot processing of the lot of the process concerned is carried out to each down stream processing determined in the order decision section 203 of the process processing classified by equipment. Specifically, the front mechanism of the down stream processing concerned makes a Max value the number of processing lots about down stream processing more than the number of Max mechanism lots. The front mechanism of the down stream processing concerned makes the front mechanism of the down stream processing concerned in the time concerned the number of processing lots about the thing of under the number of Max mechanism lots.

[0020] Next, the scheduler simulator 300 consists of the schedule start time decision section 301, scheduling, and the order of the lot processing classified by manufacturing installation and the number information bureau of processing lots 302 for simulation, and the scheduling simulation activation section 303.

[0021] Here, the schedule initiation time information 301 shows the completion schedule time of day of all the conditions under operation of all the manufacturing installations in a semi-conductor plant, a maintenance, and failure or a processing schedule lot, and the completion schedule time of day of a maintenance schedule, and the time of day or later is set as the creation object of a scheduler simulator. Moreover, the order of the lot processing classified by manufacturing installation and the number information bureau 302 of processing lots for scheduling and simulation hold the information about the order of down stream processing and its number of lots according to manufacturing installation for the scheduling simulation obtained in the order decision section 203 of the process processing classified by equipment, and the number decision section 204 of processing lots. Furthermore, the scheduling simulation

activation section 303 is the basic function of commercial software, and is a part which processes in the order which began equipment, and continues and processes the number of lots of the same form process when there are many front mechanism lots.

[0022] Drawing 2 shows the detail of processing of the order decision section 203 of the process processing classified by equipment in drawing 1, and drawing 3 shows the detail of processing of the number decision section 204 of processing lots. In addition, "S" means the step below.

[0023] In drawing 2, if processing of the order decision section 203 of the process processing classified by equipment is started (S203a), first, the equipment for a schedule will be extracted (S203b), it will confirm whether to be the process of the equipment which can be processed (S203c), and the process in the equipment which can be processed will be extracted (S203d). Next, it confirms whether it is in agreement with down stream processing in front of schedule start time (S203e), and it is aimed only at the process of an inequality.

[0024] Subsequently, it confirms whether the front-face mechanism of process equipment concerned exceeds each number of down-stream-processing Min (min) lots to all the processes that can be processed of fulfilling the above-mentioned conditions (S203f), and all the above-mentioned conditions are fulfilled to down stream processing for a schedule (S203g). In addition, about what does not fulfill conditions on the way, rerun is performed from the extract of down stream processing. Here, the mechanism balance of the whole semi-conductor plant is further taken into consideration to down stream processing for a schedule. The front-face mechanism of equipment of the number of the front-face mechanism lots of equipment of down stream processing for a schedule and the process concerned is evaluated. the front mechanism of the down stream processing concerned -- many -- a process with few front mechanisms of degree process -- that is, -- "-- the number of front-face mechanisms of down stream processing - concerned -- number of front-face mechanisms of degree process" is judged (S203h), and process processing is performed to descending of this value (S203i). It performs until the scheduling of all manufacturing installations completes this procedure (S203j). If the scheduling of all manufacturing installations is completed, processing of the order decision section 203 of the process processing classified by equipment will be ended (S203k).

[0025] Next, with reference to drawing 3, processing of the number decision section 204 of processing lots is explained.

[0026] Initiation of processing performs the comparison (the number of front-face mechanism of down stream processing  $\geq$  Max mechanism lots concerned) with the front-face mechanism of down stream processing concerned, and the number of Max (max) mechanism lots (S204b). (S204a) When "the number of front-face mechanism of down stream processing  $>$  Max mechanism lots concerned" is judged, the down stream processing is made into the number of Max mechanism lots (S204c), and processing is ended (S204d). On the other hand, when "the number of front-face mechanism of down stream processing  $<$  Max mechanism lots concerned" is judged by S204b, the front mechanism of the down stream processing concerned is made into the number of processing lots (S204e), and processing is ended (S204f).

[0027] Table 1 and 2 shows the in-process inventory according to equipment process in specific time of day. These show the result of having written in the mechanism information bureau 103 in the order decision section 203 of the process processing classified by equipment, and are edited into the format of Table 1 in the case of the decision of the sequence in the order decision section 203 of the process processing classified by equipment. And the front-face mechanism lot of equipment before and behind down stream processing for a schedule (mechanism balance) is evaluated, and it utilizes for the decision of the order of the process processing classified by equipment. Specifically, the processes which can be processed by the manufacturing installation A are 4 of Process a, Process d, Process i, and Process m processes. For 15 lots and Process d, four lots and Process i are [ Process a / 18 lots and Processes m of the number of mechanism lots of these four processes ] nine lots. Moreover, for three lots and Process d, six lots and Process i are [ Process a / 12 lots and Processes m of the number of mechanism lots of degree process ] five lots. Here, if it assumes that the front mechanism of four process is over a Min value above and the value of X is computed, 6 and Process m will be set [ 12 and Process d ] to 4 by 2 and Process i, and Process a will be processed in order of the process a-> process i-> process m-> process d. In addition, a manufacturing installation B is processed similarly and comes to be shown in Table 2.

[0028]

[Table 1]

製造装置A

工程	同工程仕掛	次工程仕掛
a	15	3
d	4	6
i	18	12
m	9	5

[0029]

[Table 2]

製造装置B

工程	同工程仕掛	次工程仕掛
b	12	4
e	8	6
z	10	8

Table 3 shows the Min value-Max value classified by process. A Min-Max value is a value given beforehand, and when the number of the front-face mechanisms of a process is below Min, the process concerned does not turn into down stream processing for a schedule. Moreover, when the number of the front-face mechanisms of a process is more than Max, the value (Max value) is made into the number of processing lots of the process concerned.

[0030]

[Table 3]

工程	Min 値	Max 値
a	3	15
b	3	15
c	3	15
d	3	15
e	2	15
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
x	5	15
y	5	15
z	5	15

[Translation done.]



\* NOTICES \*

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

DESCRIPTION OF DRAWINGS

---

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the process of the scheduling approach in semi-conductor manufacture of this invention.

[Drawing 2] It is the flow chart which shows the detail of processing of the order decision section of the process processing classified by equipment of drawing 1 .

[Drawing 3] It is the flow chart which shows the detail of processing of the number decision section of processing lots of drawing 1 .

[Description of Notations]

100 Production Control System

101 Equipment Operating Status Information Bureau

102 Equipment Reservation Status Information Section

103 Mechanism Information Bureau

200 The Number Decision Section of Order Decision [ of Process Processing Classified by Equipment ] / Processing Lots

201 Schedule Start Time Decision Section Classified by Equipment

202 Mechanism Information Write-in Section

203 The Order Decision Section of Process Processing Classified by Equipment

203 The Number Decision Section of Processing Lots

300 Scheduler Simulator

301 Schedule Start Time Decision Section

303 Scheduling Simulation Activation Section

---

[Translation done.]

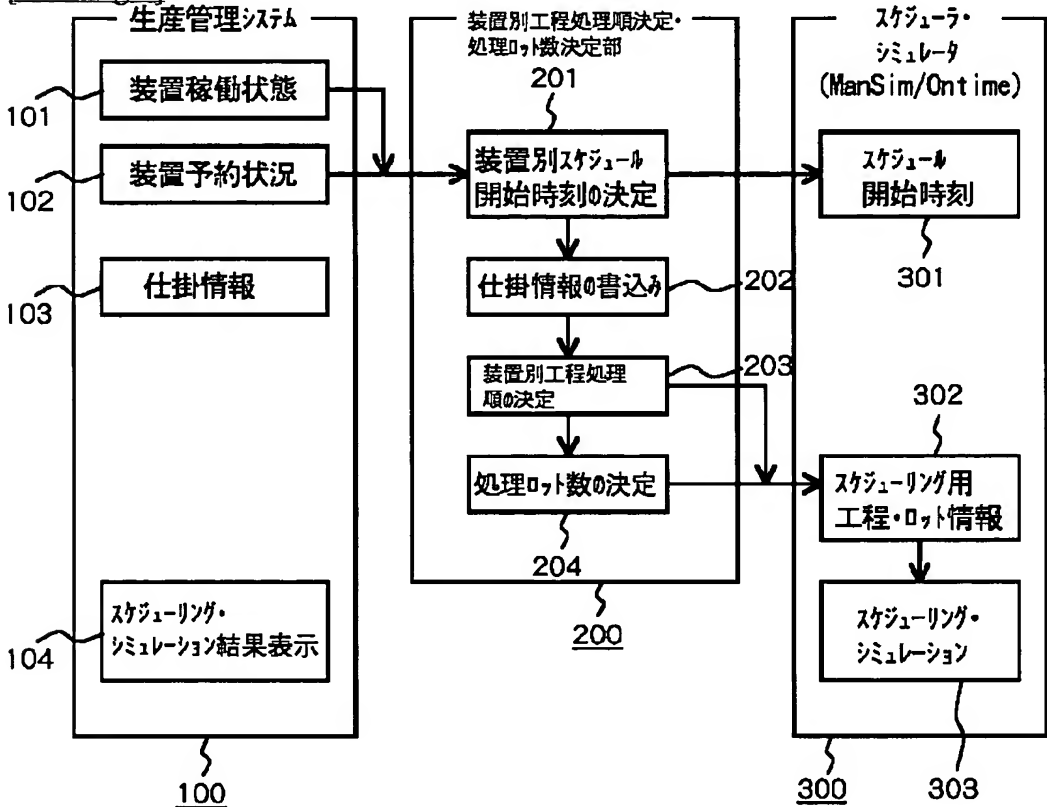
\* NOTICES \*

JPO and NCIPi are not responsible for any damages caused by the use of this translation.

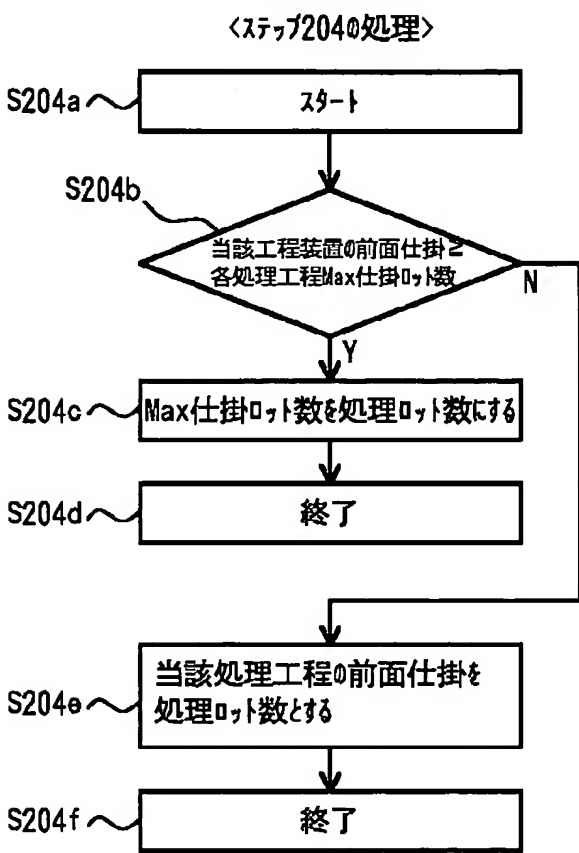
- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

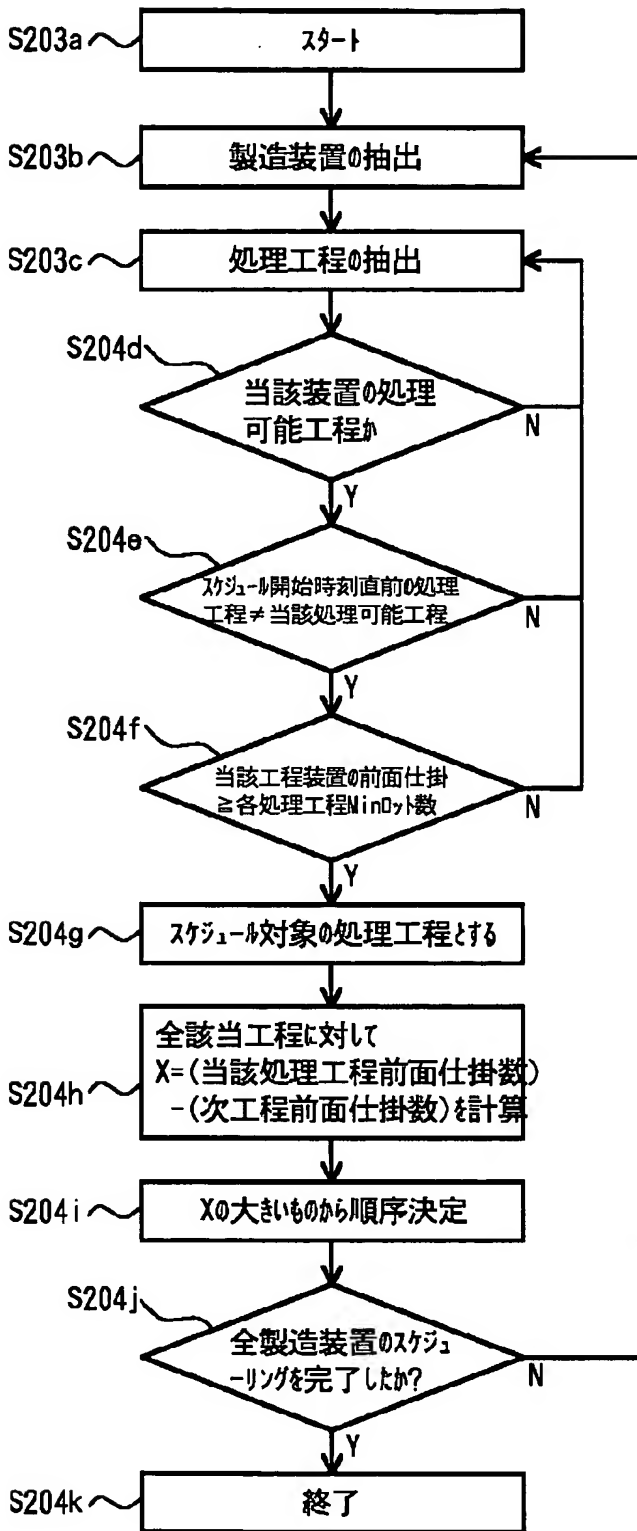


[Drawing 3]



[Drawing 2]

〈ステップ2030の処理〉



[Translation done.]

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ ~~FADED TEXT OR DRAWING~~
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ ~~GRAY SCALE DOCUMENTS~~
- ☒ ~~LINES OR MARKS ON ORIGINAL DOCUMENT~~
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**